Math 187 Spring 2013 second logic worksheet

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February 6, 2013

1. Verify the equivalences $\neg P \rightarrow Q \equiv P \vee Q$ and $(A \rightarrow C) \wedge (B \rightarrow C) \equiv (A \vee B) \rightarrow C$ mentioned in the style manual, using truth tables.

   Use a truth table to support the assertion that $(A \rightarrow C) \vee (B \rightarrow C)$ does NOT always imply $(A \vee B) \rightarrow C$. Hint: highlight a *row* in your table.

2. Write a proof of $((P \rightarrow Q) \wedge (Q \rightarrow R)) \rightarrow (P \rightarrow R)$ in the style presented in class and in the style manual.

3. The following is the inference rule of *destructive dilemma*. Verify it using our system of rules. You can use the proof of constructive dilemma which appears as an example in the style manual as a model.

$$\begin{array}{c} P \rightarrow Q \\ R \rightarrow S \\ \neg Q \vee \neg S \\ \hline \neg P \vee \neg R \end{array}$$

   This will be a proof by cases!

4. Write a proof of $((P \rightarrow Q) \wedge (\neg P \rightarrow Q)) \rightarrow Q$ in the stye presented in class and in the style manual. I can see two ways to do this. You could start by proving $P \vee \neg P$ (which is very short though you might have to think a little to see how it works), or you could prove the contrapositive.

5. Write a proof of $((P \wedge Q) \vee (\neg Q \wedge R)) \rightarrow (P \vee R)$ in the style presented in the style manual.